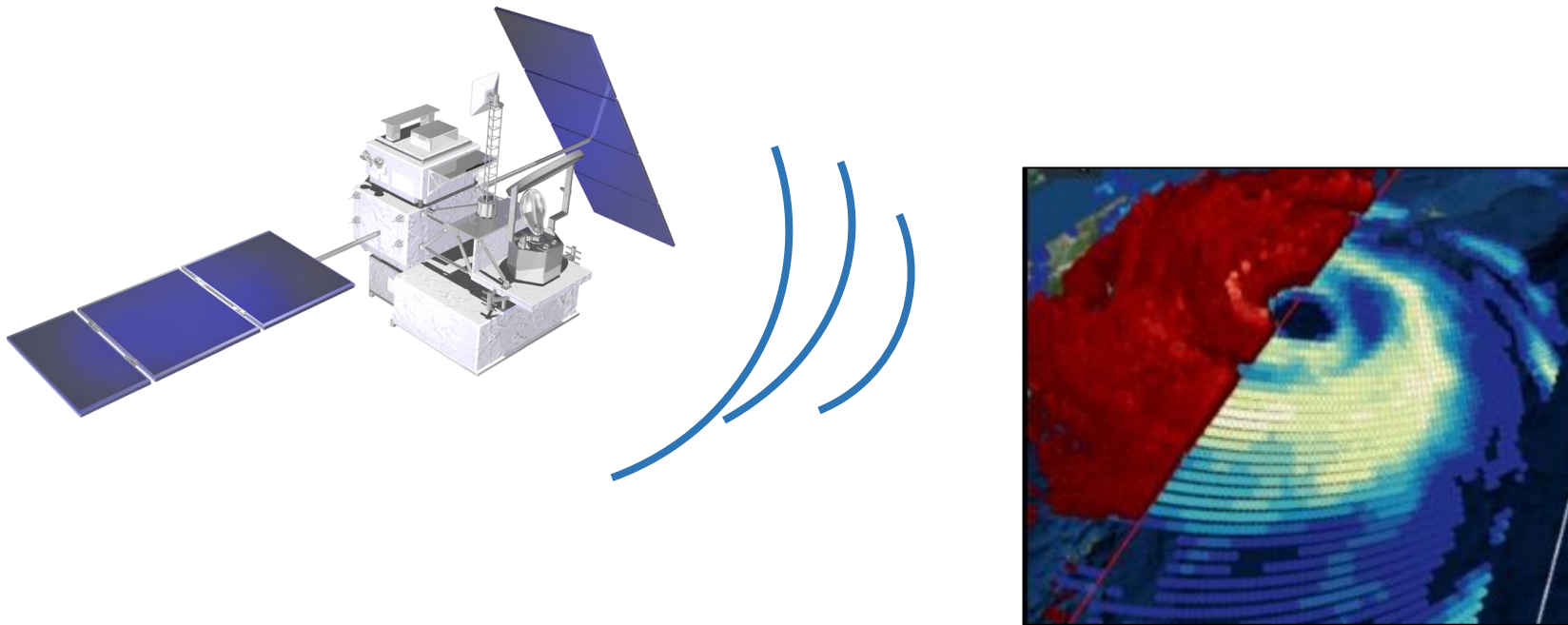


Web-Based Geospatial Visualization of GPM Data with CesiumJS



March 27, 2018

Matt Lammers (matthew.r.lammers@nasa.gov)

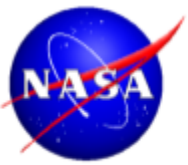
***Senior Science Data Visualization Analyst/Software Engineer
NASA Goddard Space Flight Center / SGT, Inc.***



Outline



- **GPM Data – What is it?**
- **CesiumJS – What is it? How can I use it?**
- **Putting the Two Together!**

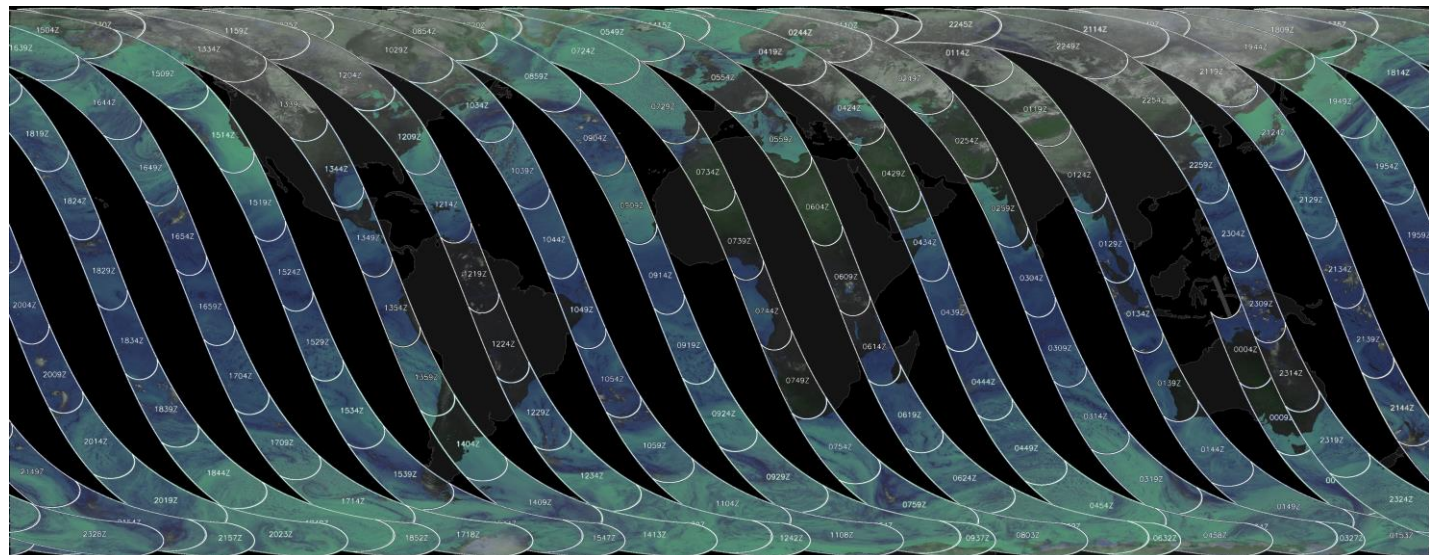


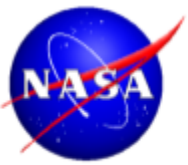
About GPM



- GPM: Global Precipitation Measurement Mission Core Satellite
- Contains Two Instruments: GPM Microwave Imager (GMI) and Dual-frequency Precipitation Radar (DPR)
- Orbits every ~ 90 minutes between $\pm 67^\circ$

Latitude



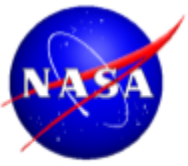


GPM Products



<https://storm.pps.eosdis.nasa.gov>

- Level 1: Raw Swath-Based Data
 - Counts from DPR
 - Brightness Temperature from GMI (and partner instruments)
- Level 2: Derived Swath-Based Data
 - Precipitation Variables from DPR and GMI (and partner instruments)
- Level 3: Aggregated Lat/Lon Gridded Data
 - Precipitation Variables from DPR and GMI (and partner instruments)

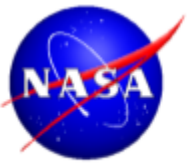


About CesiumJS



<https://cesiumjs.org>

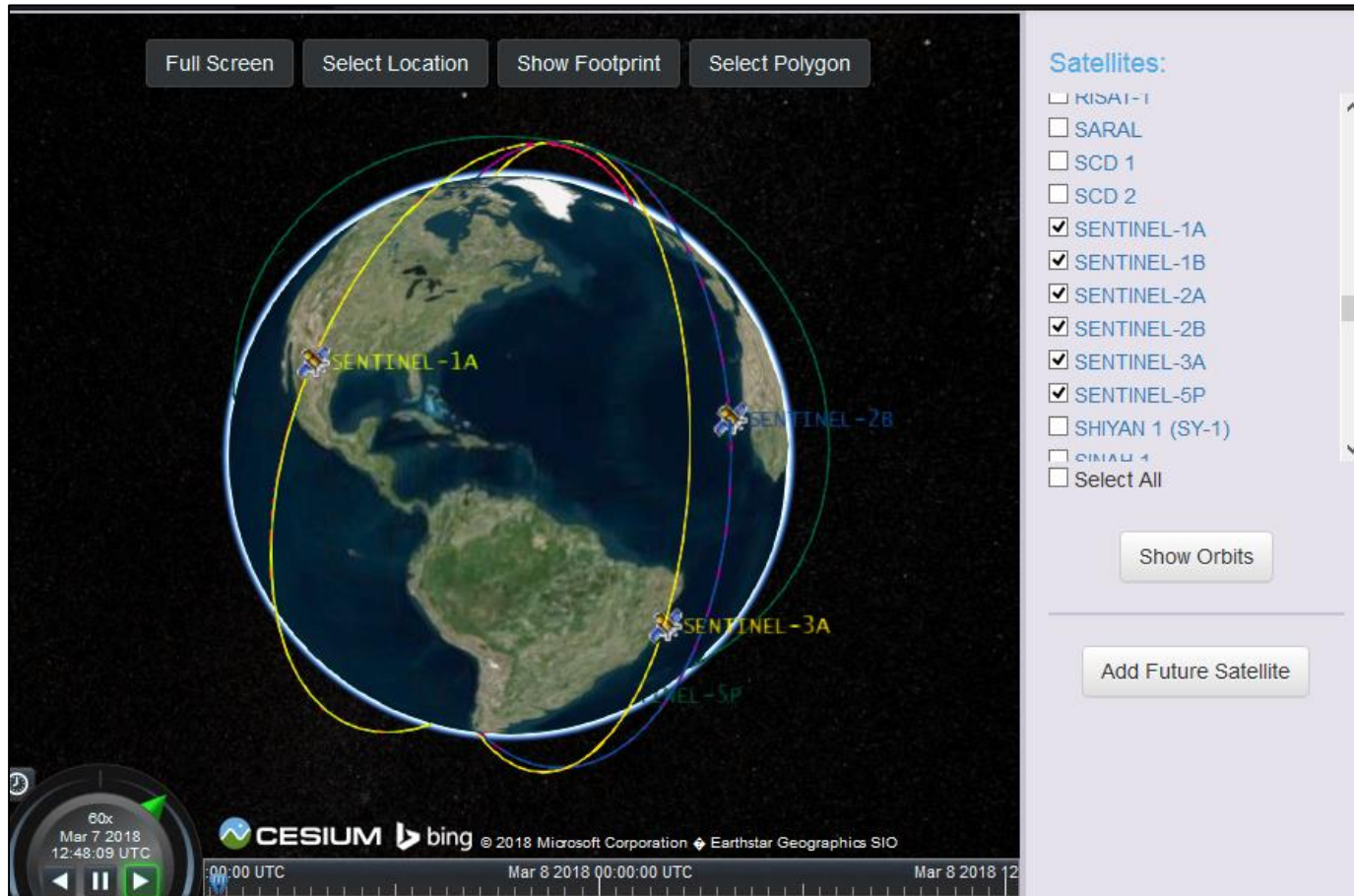
- Open Source JavaScript Library for Visualizing Data On, Above, and Below the Earth's Surface
- Everything is Online
- Works with Time-Varying Data
- Moving Toward 3DTiles for Point Clouds, Vector Tiles, and 3D Shapes



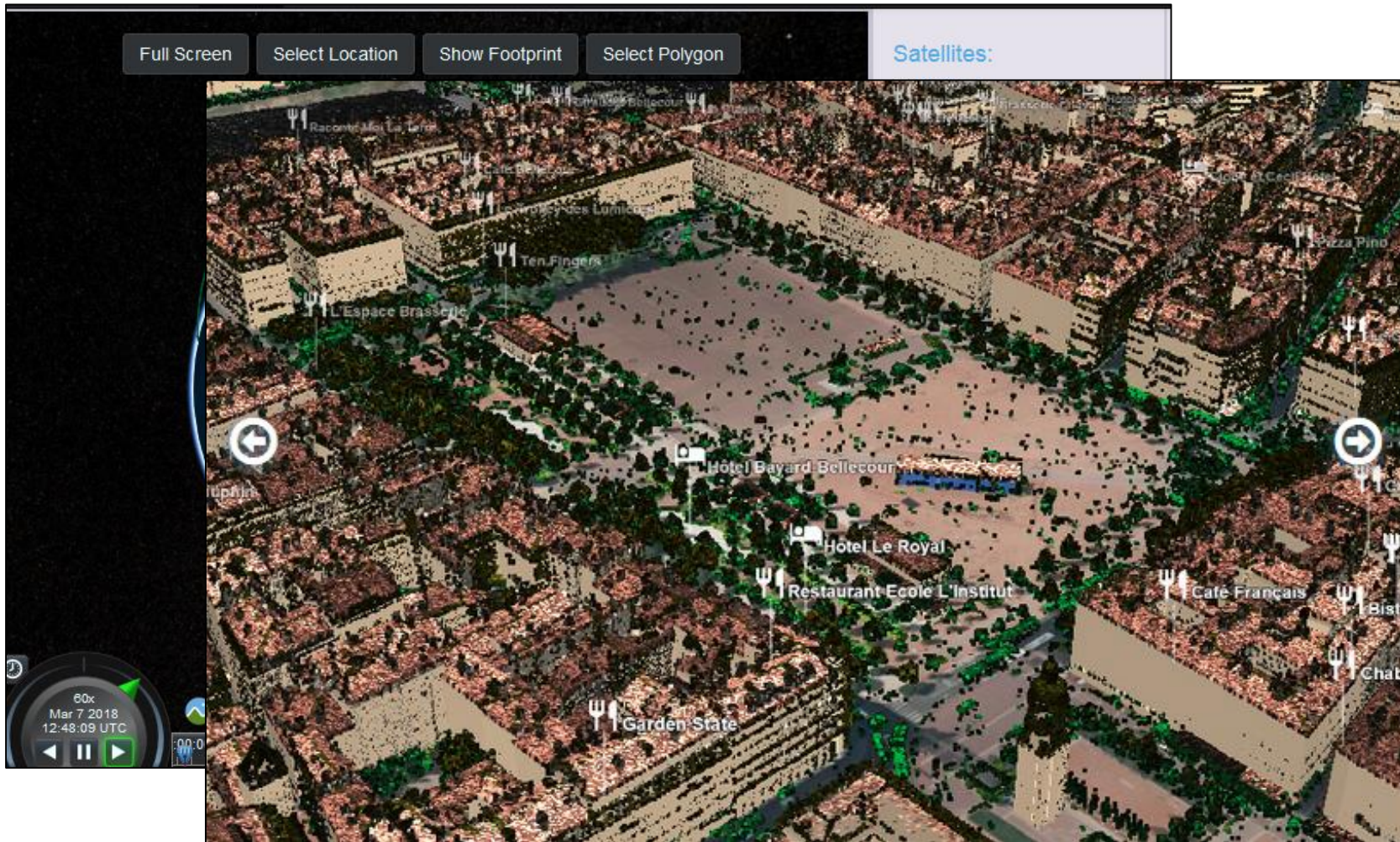
CesiumJS Examples

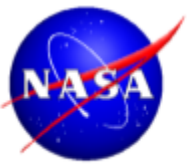


<https://cesiumjs.org/demos>



<https://cesiumjs.org/demos>

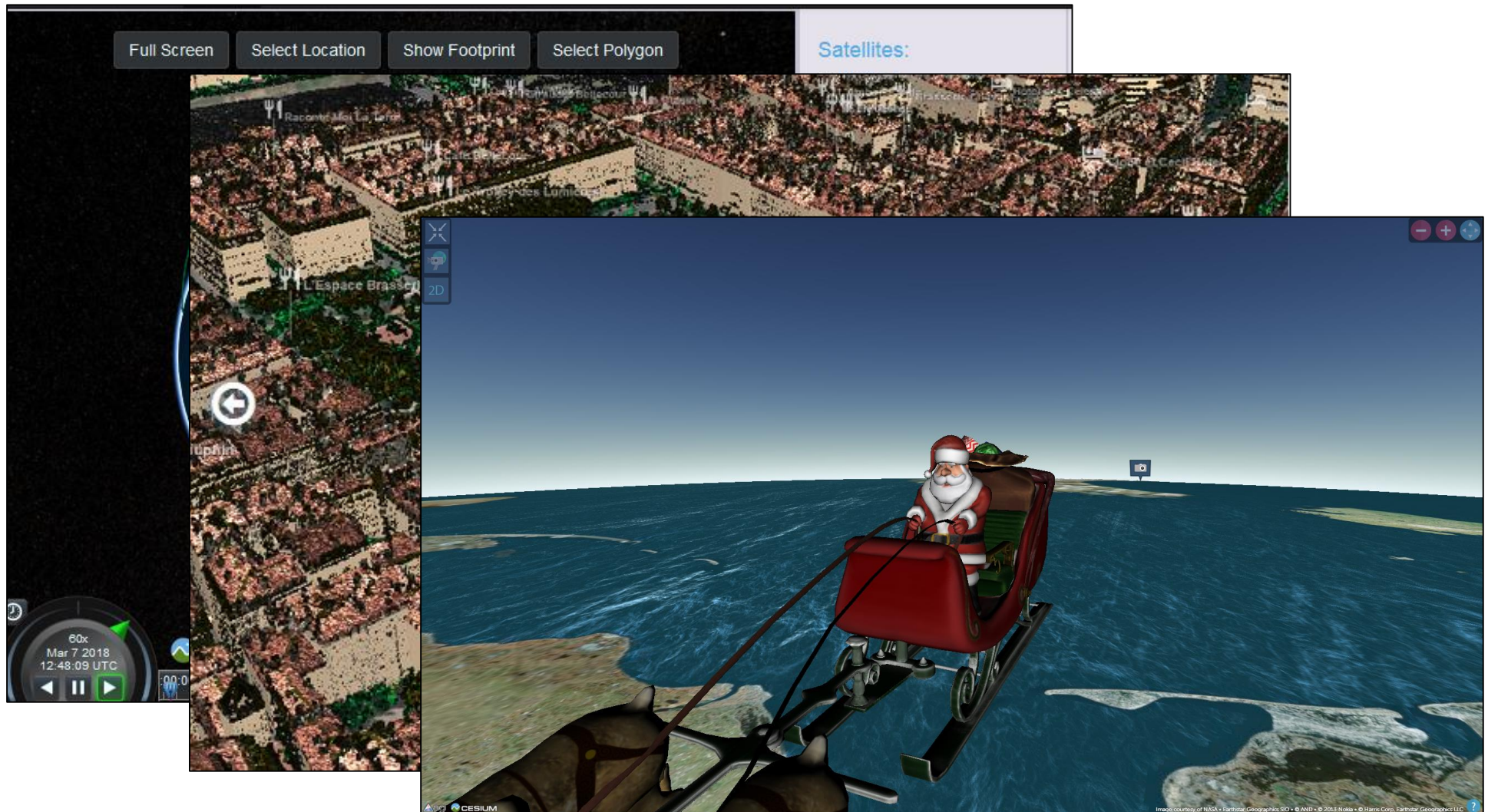


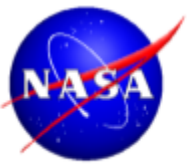


CesiumJS Examples



<https://cesiumjs.org/demos>

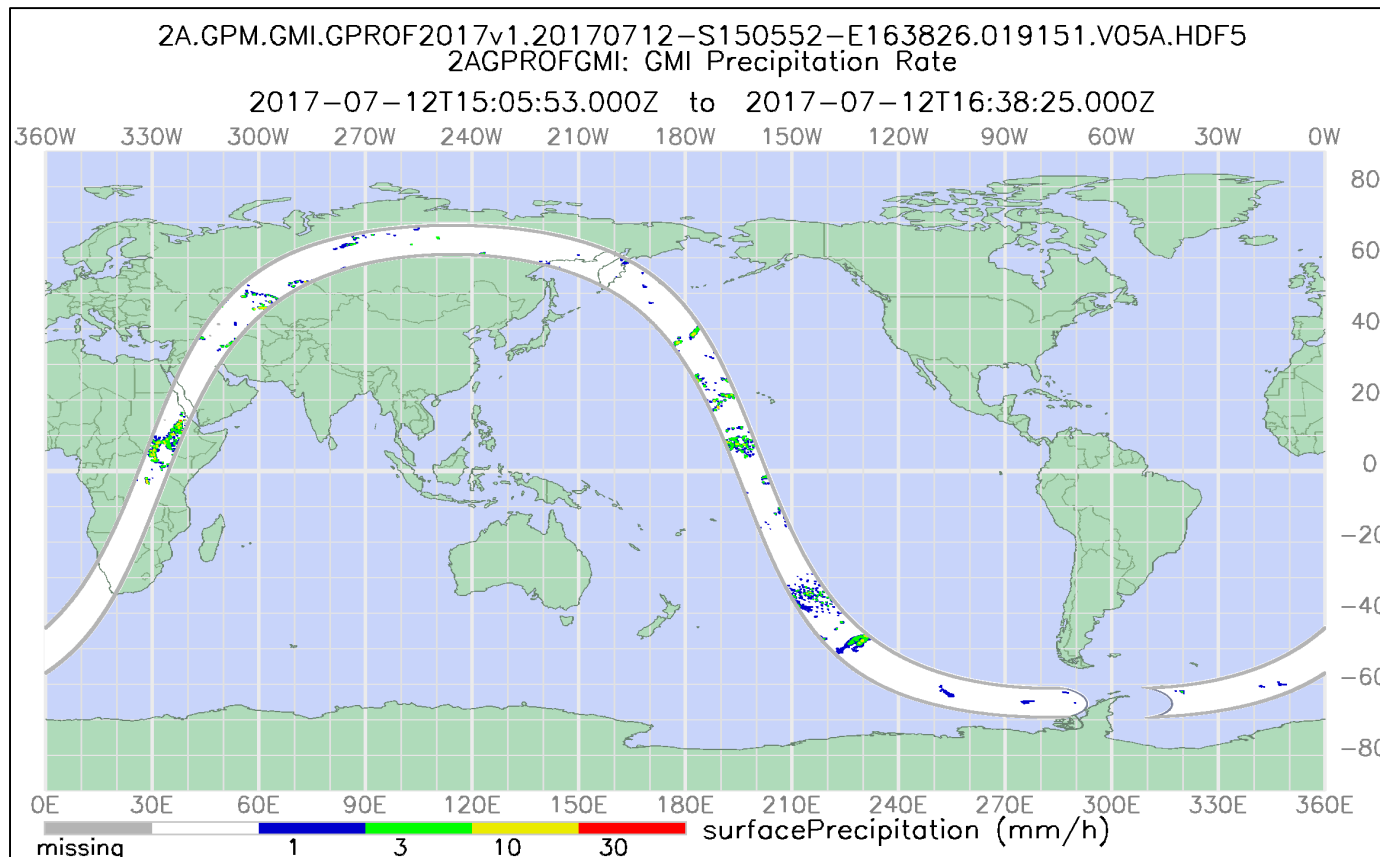


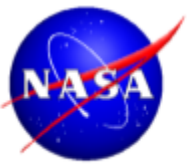


Putting Them Together



When I came to NASA, project scientists were making decisions about data acquisition based on static images.



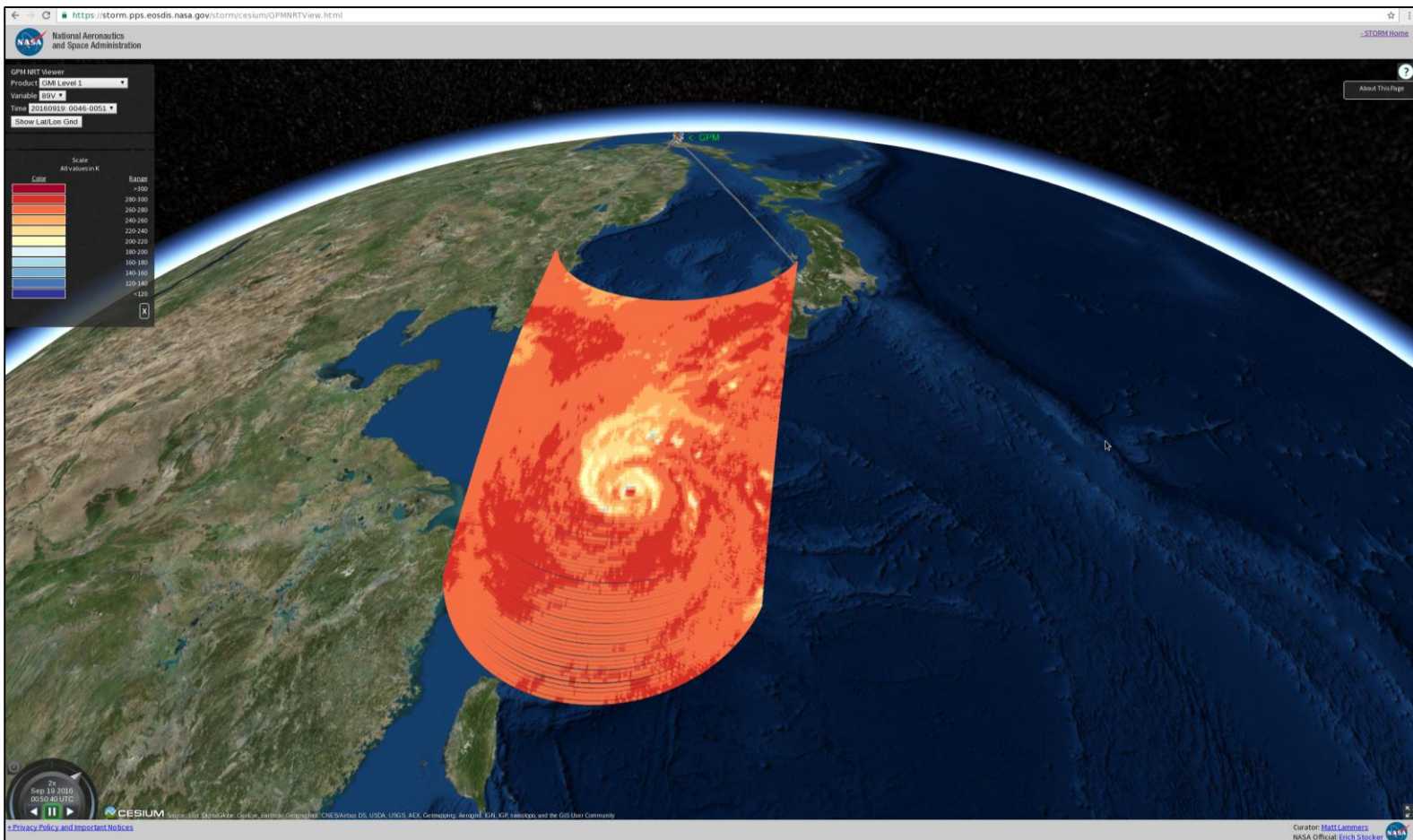


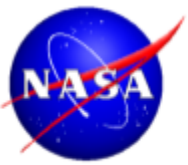
Putting Them Together



<https://storm.pps.eosdis.nasa.gov/storm/GPMNRTView.html>

Near Real Time Viewer



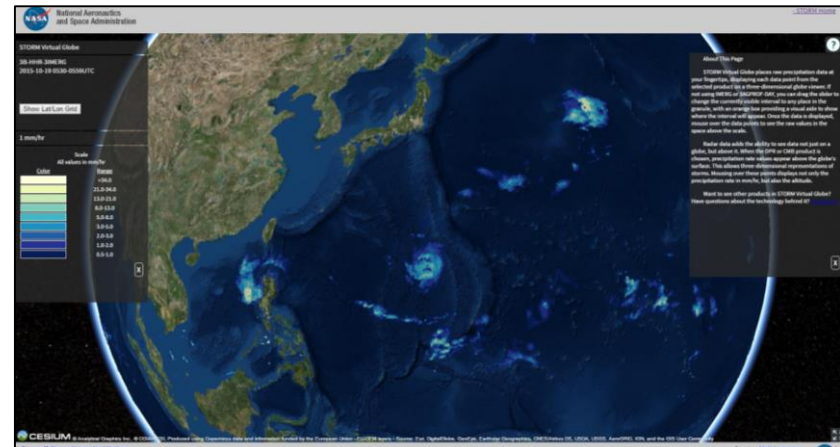
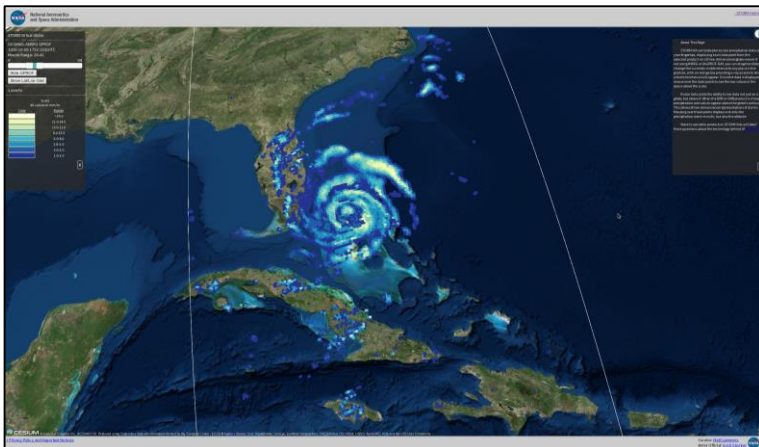
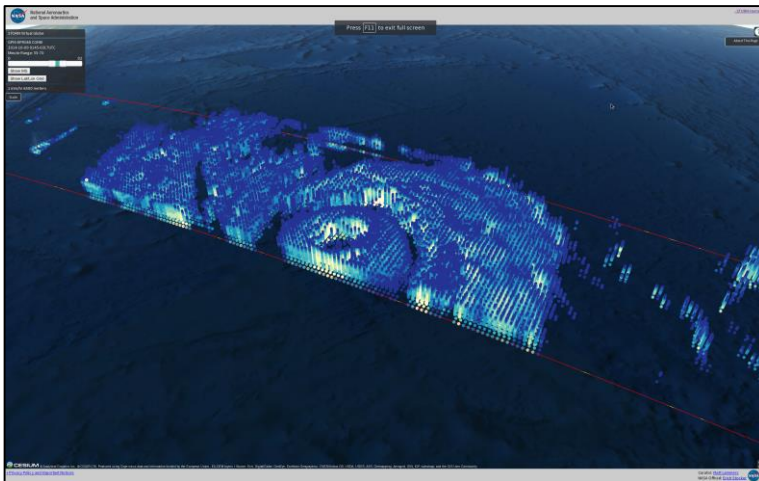


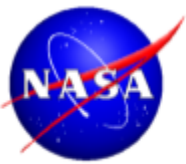
Putting Them Together



<https://storm.pps.eosdis.nasa.gov/storm/Tools.jsp>

Virtual Globe





Putting Them Together



<https://storm.pps.eosdis.nasa.gov/storm/Analysis.jsp>


Swath-Based Analysis Tool + Virtual Globe

Available Instruments:
Click to select one. Hold CTRL and click to select multiple.

GPM-GMI	GPM-DPR	GPM-Ka MS	GPM-Ku
GPM-CMB	TRMM-TMI	NPP-ATMS	GCOMW1-AMSR2
NOAA15-AMSUB	NOAA16-AMSUB	NOAA17-AMSUB	NOAA18-MHS
NOAA19-MHS	METOP-A-MHS	METOP-B-MHS	F11-SSM/I
F13-SSM/I	F14-SSM/I	F15-SSM/I	F17-SSM/I
F18-SSM/I	F19-SSM/I	AQUA-AMSRE	

Date Range:
Valid Range is between 19971201 and 20180306
YYYYMMDD [HH:MM]
Start Date/Time: 20140401
Stop Date/Time: 20141231 23:59

Geographic Domain:
Use the buttons on the top-left to select a geographic area, or type the box into the inputs below.
Lat Lng:



Northern Latitude: 26.096 Southern Latitude: 33.937
Eastern Longitude: 34.929 Western Longitude: 31.721

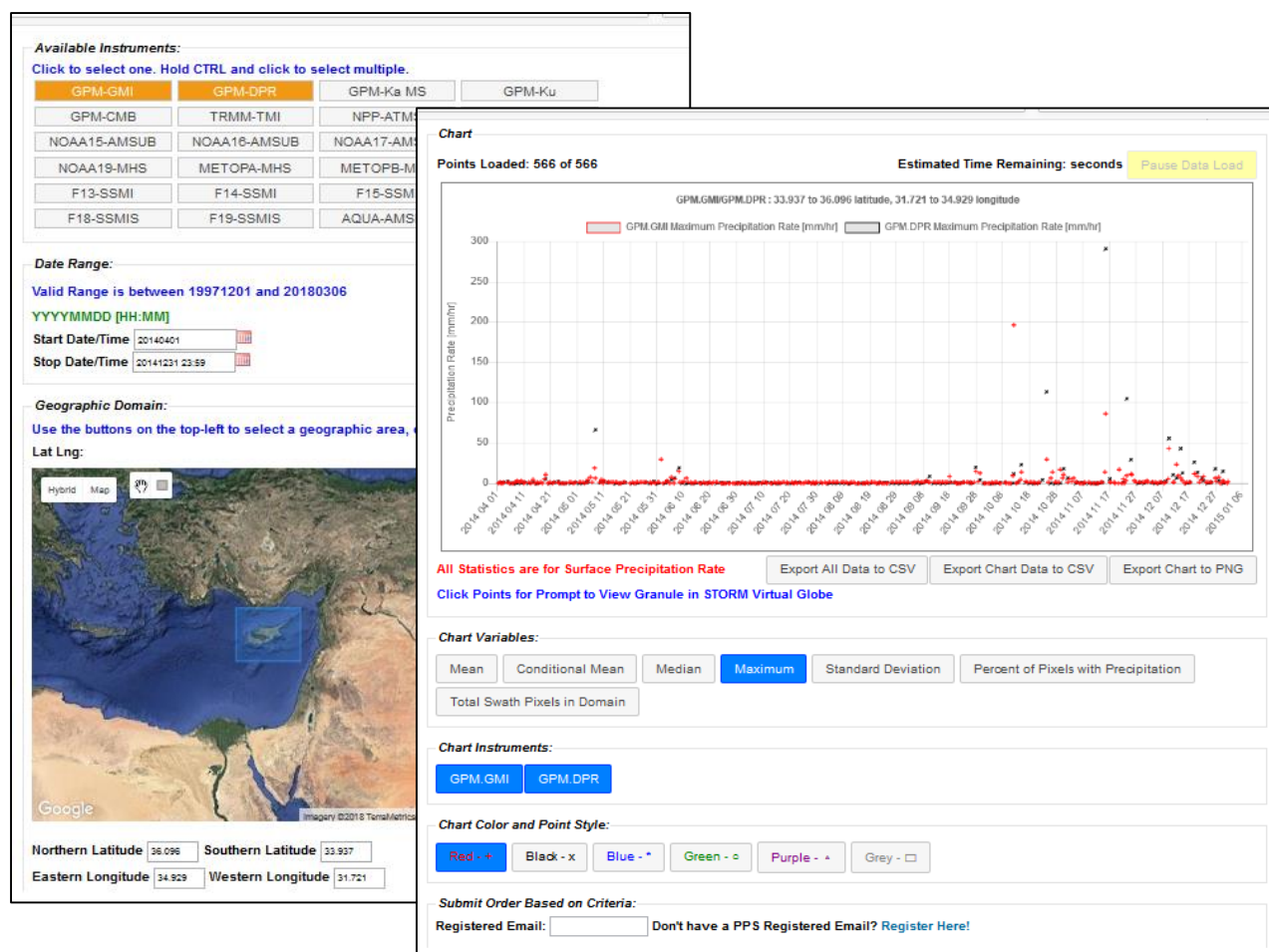


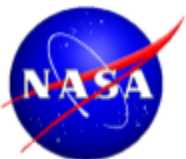
Putting Them Together



<https://storm.pps.eosdis.nasa.gov/storm/Analysis.jsp>

Swath-Based Analysis Tool + Virtual Globe



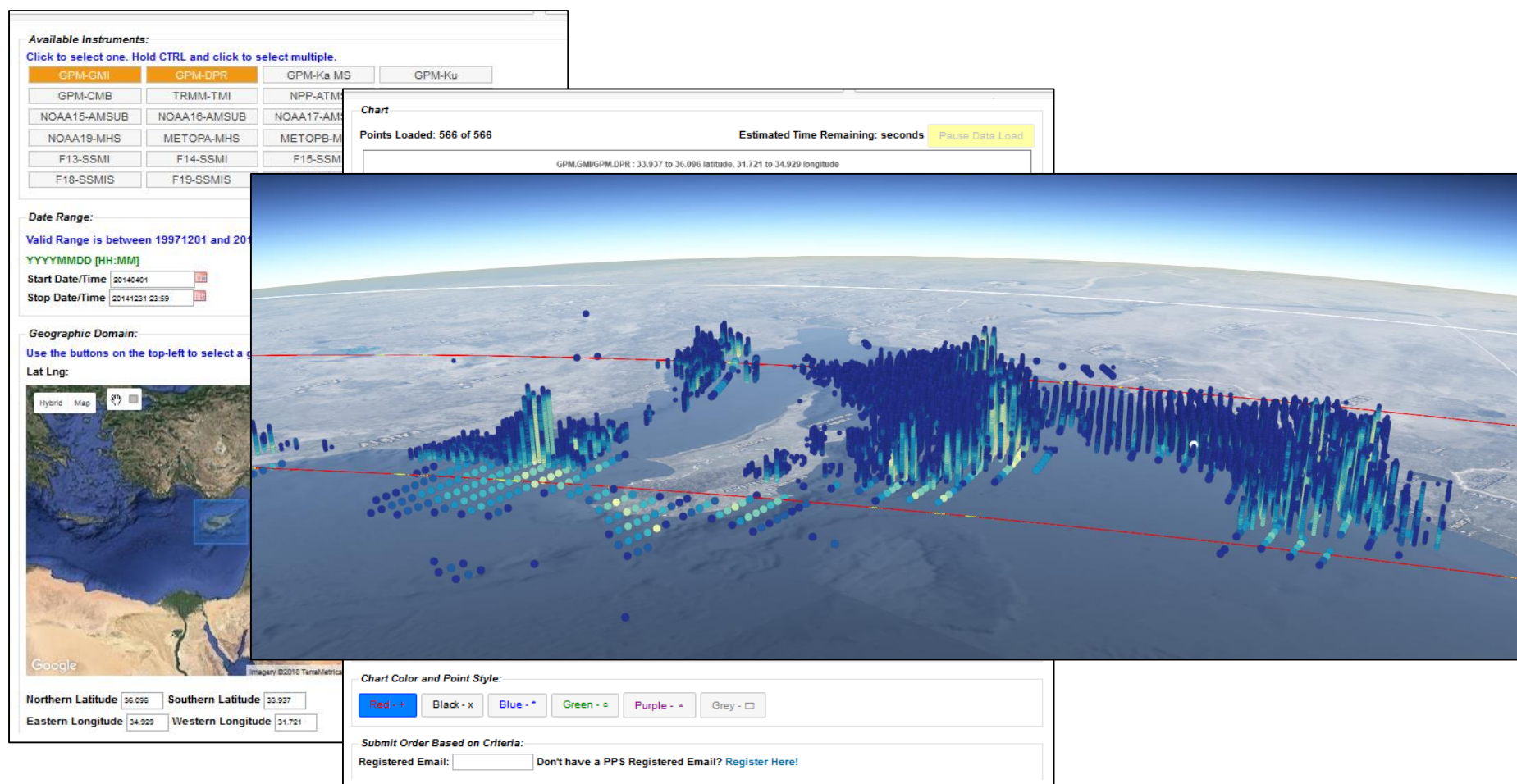


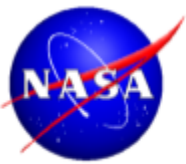
Putting Them Together



<https://storm.pps.eosdis.nasa.gov/storm/Analysis.jsp>

Swath-Based Analysis Tool + Virtual Globe



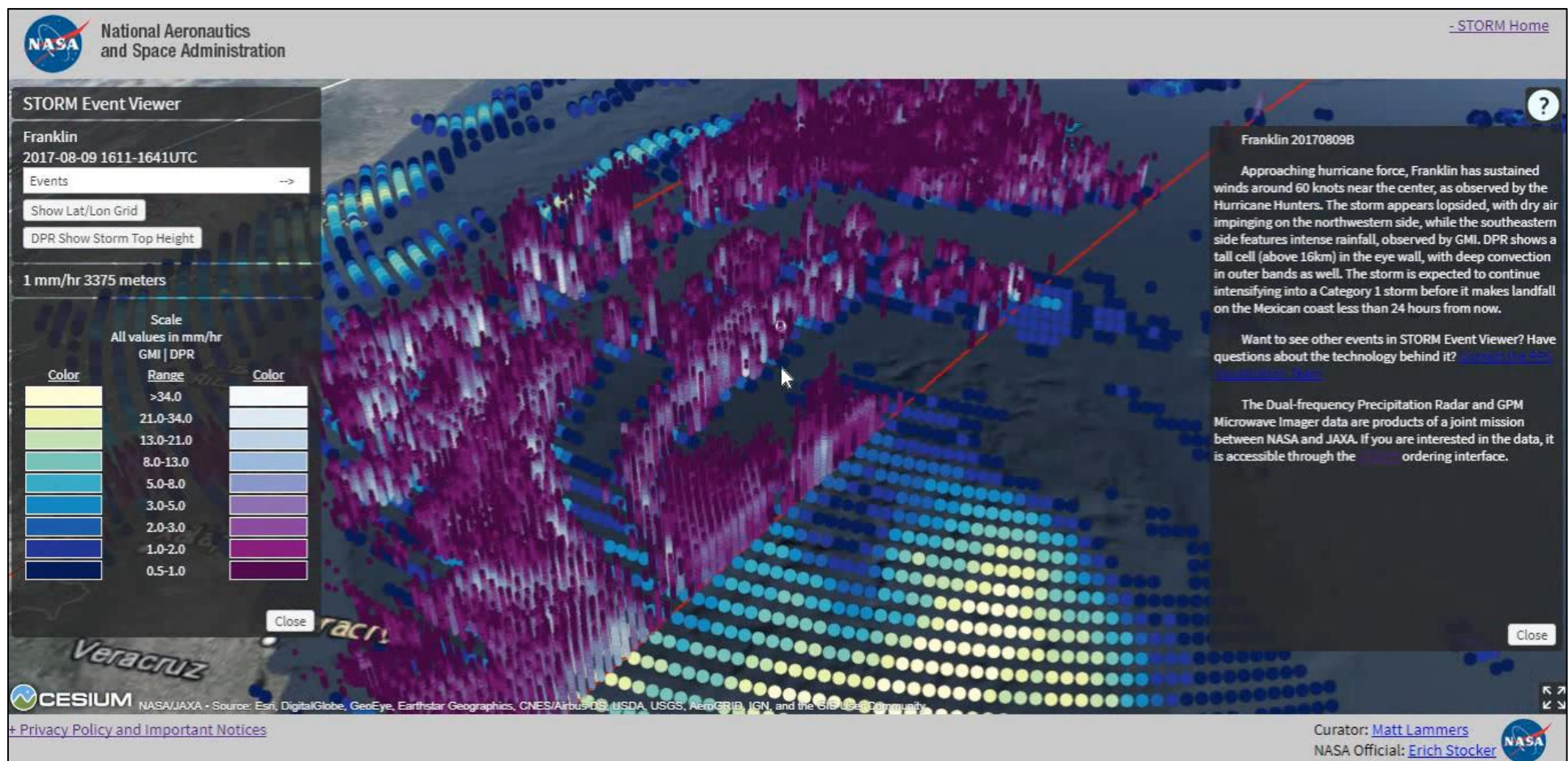


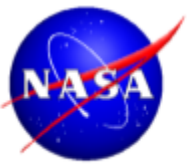
Putting Them Together



<https://pmm.nasa.gov/storm-viewer/EventViewer.html>

Event Viewer



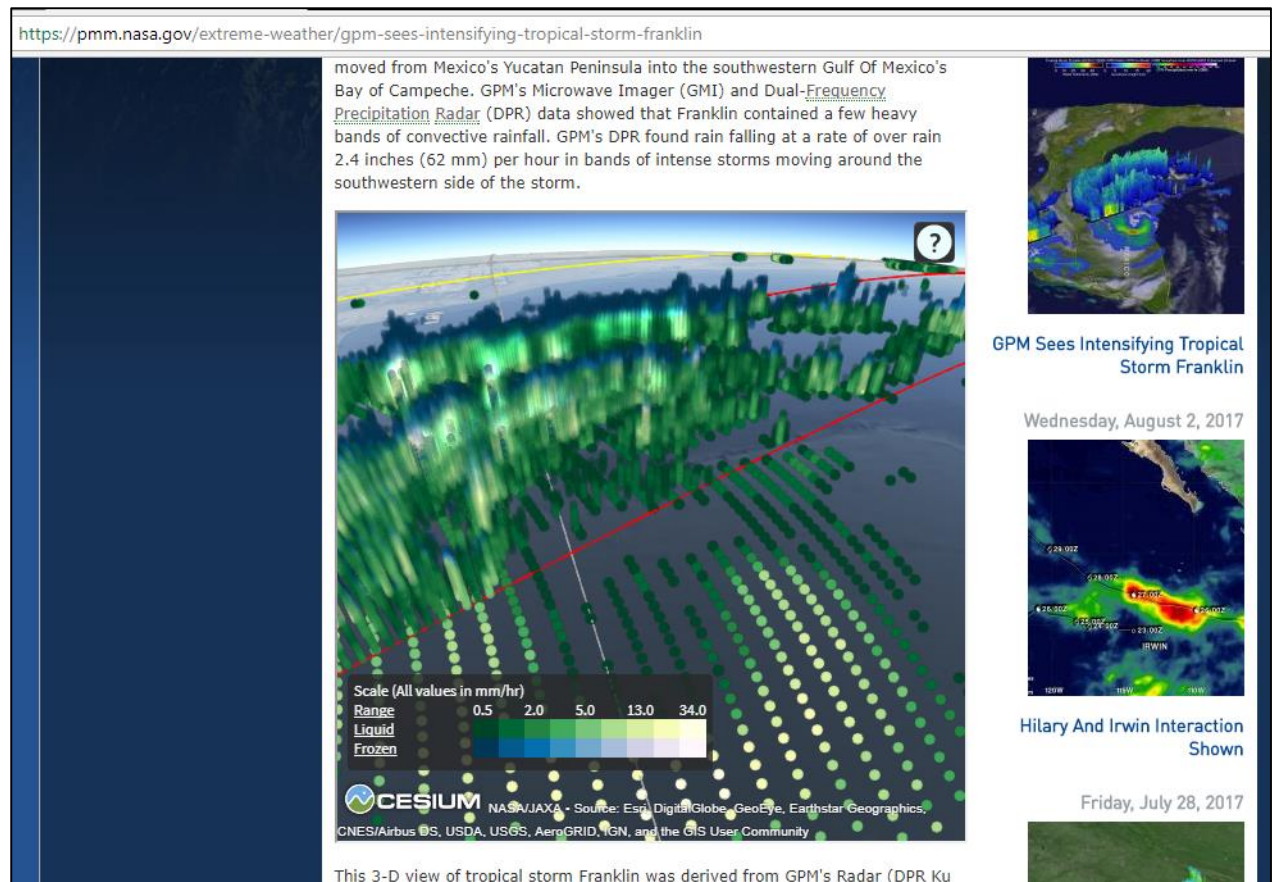
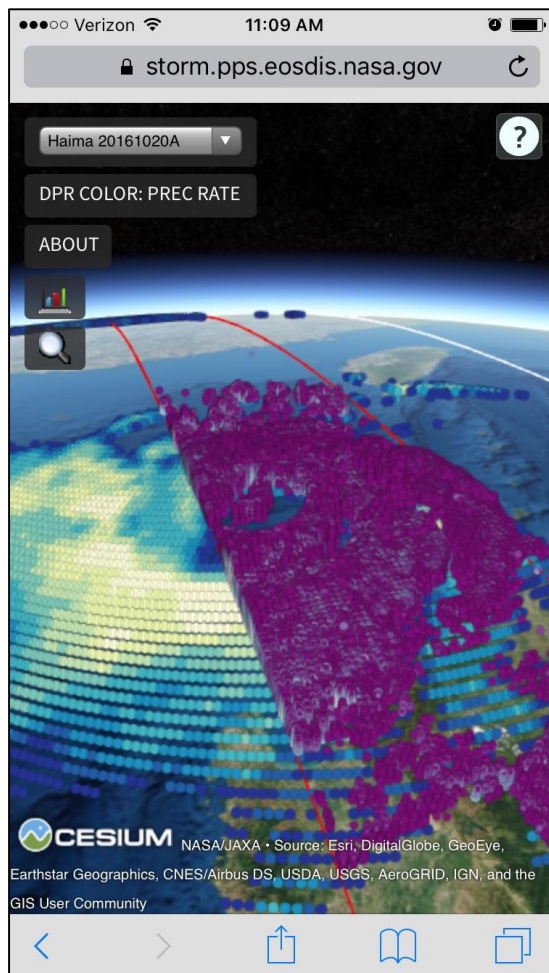


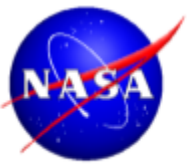
Putting Them Together



<https://pmm.nasa.gov/storm-viewer/EVMini.html>

EV Mini/EV Micro



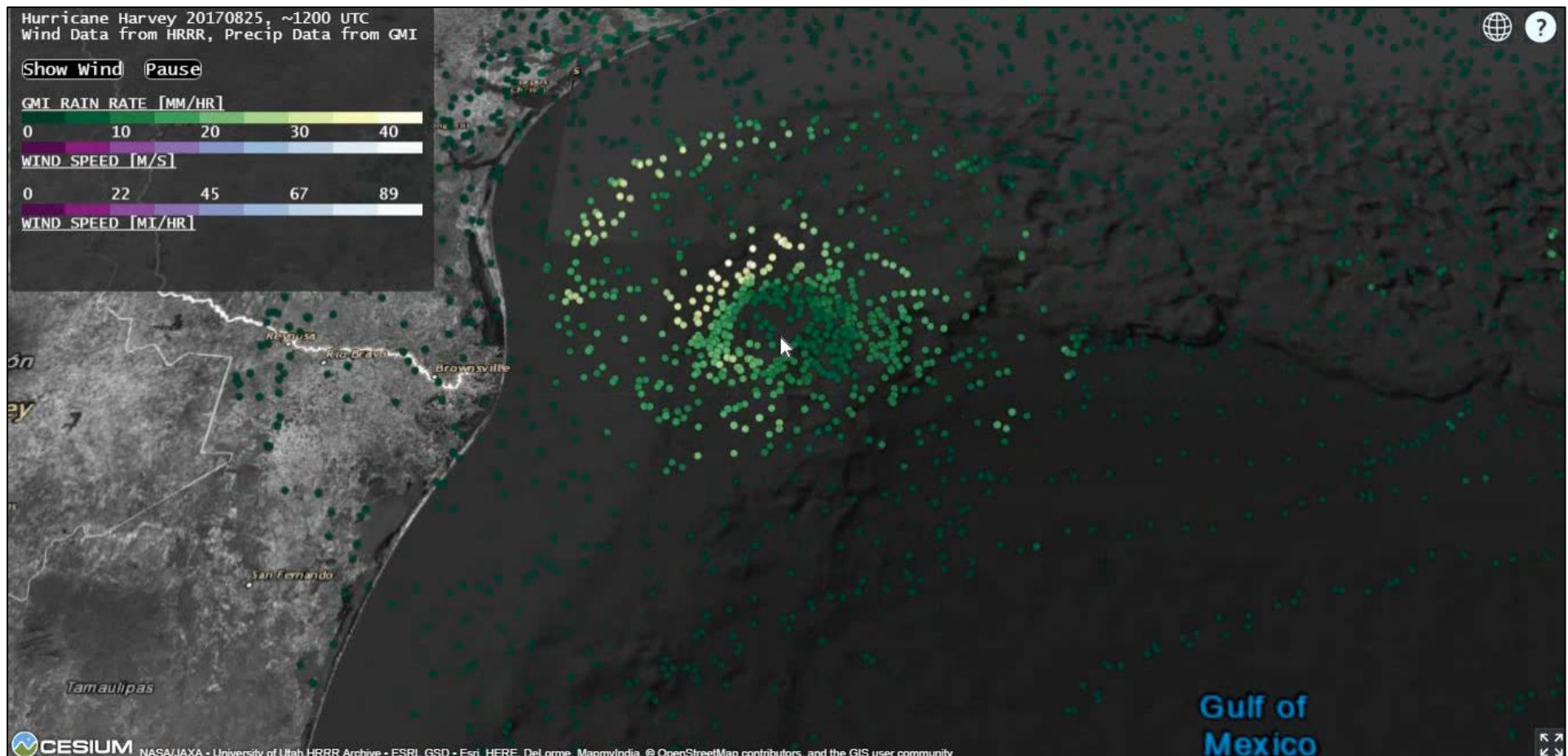


Putting Them Together

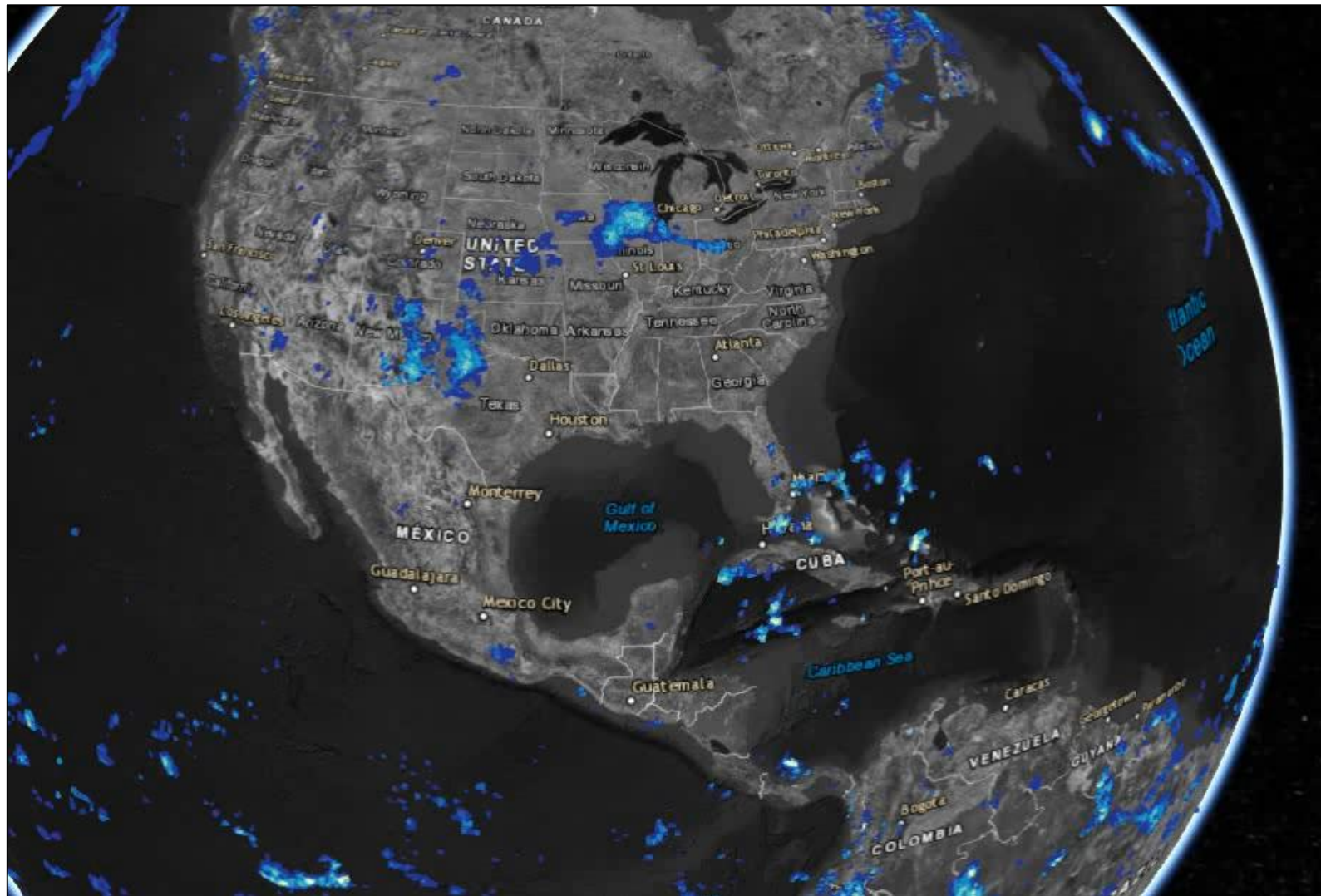


<https://storm.pps.eosdis.nasa.gov/storm/cesium/Spiral.html>

GMI/HRRR Spiral



IMERG Time Lapse (Point Clouds)





Conclusion



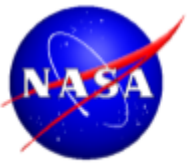
- We have tons of precipitation-related satellite products from the last two decades
- Even if you don't use precipitation information, think about how your data can be made more interactive and displayed more fully using new technologies like CesiumJS
- Happy to discuss technical details rest of week

Questions?

matthew.r.lammers@nasa.gov

<https://storm.pps.eosdis.nasa.gov>

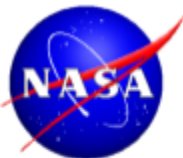
<https://cesiumjs.org>



Conclusion



Extra Slides...



Acquiring GPM Files



<https://storm.pps.eosdis.nasa.gov>

Need Help?

- Click on for context specific help.
- STORM User Guide
- Help Desk

Number of granules
16

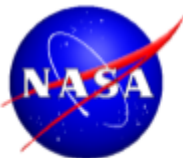
Search Results

Left click on the header to sort columns. Right click to view additional info (file name, satellite, instrument, format and version).

Select	Data Type	Algorithm	Download / View	Start Time	Stop Time	Orbit #	Format
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-08 23:58:18	2016-03-09 01:30:48	11519	hdf5
<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 01:30:49	2016-03-09 03:03:19	11520	hdf5
<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 03:03:20	2016-03-09 04:35:49	11521	hdf5
<input checked="" type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 04:35:50	2016-03-09 06:08:19	11522	hdf5
<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 06:08:20	2016-03-09 07:40:50	11523	hdf5
<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 07:40:51	2016-03-09 09:13:21	11524	hdf5
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<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 15:23:27	2016-03-09 16:56:00	11529	hdf5
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<input checked="" type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 18:28:35	2016-03-09 20:01:08	11531	hdf5
<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 20:01:09	2016-03-09 21:33:42	11532	hdf5
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<input type="checkbox"/>	2A	2AGPROFGMI		2016-03-09 23:06:17	2016-03-10 00:38:50	11534	hdf5

Total Granules selected: 3

1 Records from 1 to 16 of 16



Acquiring GPM Files



<https://storm.pps.eosdis.nasa.gov>

STORM Swath-Based Analysis Tool

This tool enables comparisons between domain-aggregated values from different GPM and Partner Instruments. Select one or more instruments, a date range, and a geographic domain. The tool will display statistical values on an interactive graph, with the ability to change what statistics, what instruments, and what colors are displayed. All values are aggregated from swath pixels within the geographic domain selected.

Available Instruments:

Click to select one. Hold CTRL and click to select multiple.

GPM-GMI	GPM-DPR	GPM-Ka MS	GPM-Ku
GPM-CMB	TRMM-TMI	NPP-ATMS	GCOMW1-AMSR2
NOAA15-AMSUB	NOAA16-AMSUB	NOAA17-AMSUB	NOAA18-MHS
NOAA19-MHS	METOPA-MHS	METOPB-MHS	F11-SSMI
F13-SSMI	F14-SSMI	F15-SSMI	F17-SSMIS
F18-SSMIS	F19-SSMIS	AQUA-AMSRE	

Date Range:

Valid Range is between 19971201 and 20180305

YYYYMMDD [HH:MM]

Start Date/Time 20170301

Stop Date/Time 20170302 23:59

Geographic Domain:

Use the buttons on the top-left to select a geographic area, or type the box into the inputs below.

Lat Lng:



(format and version).

	Stop Time	Orbit #	Format
23:58:18	2016-03-09 01:30:48	11519	hdf5
01:30:49	2016-03-09 03:03:19	11520	hdf5
03:03:20	2016-03-09 04:35:49	11521	hdf5
04:35:50	2016-03-09 06:08:19	11522	hdf5
06:08:20	2016-03-09 07:40:50	11523	hdf5
07:40:51	2016-03-09 09:13:21	11524	hdf5
09:13:22	2016-03-09 10:45:52	11525	hdf5
10:45:53	2016-03-09 12:18:22	11526	hdf5
12:18:23	2016-03-09 13:50:53	11527	hdf5
13:50:54	2016-03-09 15:23:26	11528	hdf5
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16:56:01	2016-03-09 18:28:34	11530	hdf5
18:28:35	2016-03-09 20:01:08	11531	hdf5
20:01:09	2016-03-09 21:33:42	11532	hdf5
21:33:43	2016-03-09 23:06:16	11533	hdf5
23:06:17	2016-03-10 00:38:50	11534	hdf5



Acquiring GPM Files



<https://storm.pps.eosdis.nasa.gov>

STORM Swath-Based Analysis Tool

This tool enables comparisons between domain-aggregated values from different instruments. Select one or more instruments, a date range, and a geographic domain. The tool provides an interactive graph, with the ability to change what statistics, what instruments, and what values are aggregated from swath pixels within the geographic domain selected.

Available Instruments:

Click to select one. Hold CTRL and click to select multiple.

GPM-GMI	GPM-DPR	GPM-Ka MS	GPM-Ku
GPM-CMB	TRMM-TMI	NPP-ATMS	GCOMW1-AMSR2
NOAA15-AMSUB	NOAA16-AMSUB	NOAA17-AMSUB	NOAA18-MHS
NOAA19-MHS	METOP-A-MHS	METOP-B-MHS	F11-SSMI
F13-SSMI	F14-SSMI	F15-SSMI	F17-SSMIS
F18-SSMIS	F19-SSMIS	AQUA-AMSRE	

Date Range:

Valid Range is between 19971201 and 20180305

YYYYMMDD [HH:MM]

Start Date/Time 20170301

Stop Date/Time 20170302 23:59

Geographic Domain:

Use the buttons on the top-left to select a geographic area, or type the box into the inputs below.

Lat Lng:



STORM Near-Real Time Download Page

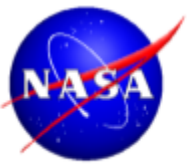
Input your NRT Registered Email:

Register Your Email [HERE](#). Make sure you Check that you are interested in NRT products.

Use the interface below as if it is a directory tree. Click on a filename to initiate the download process (which will occur in a new tab).

You can also acquire files programmatically using the API that drives this site. An example request would be: [https://storm.pps.eosdis.nasa.gov/storm/NRT?email=\[youremail\]&filename=data/documentation/IMERG_doc.pdf](https://storm.pps.eosdis.nasa.gov/storm/NRT?email=[youremail]&filename=data/documentation/IMERG_doc.pdf). Replace the [youremail] with your registered email and use the directory tree here to ensure the filename path is correct.

```
data/1C
data/1CR
data/combine
data/documentation
data/GMI1B
data/GPROF
data/Imerg
  imerg
    early
      gis
        01
        02
        2014
        2015
        2016
        2017
        early
          2014
          2015
          2016
          2017
          2018
            01
            02
            03
              3B-HHR-E.MS.MRG.3IMERG.20180301-S000000-E002959.0000.V05B.30min.tfw
              3B-HHR-E.MS.MRG.3IMERG.20180301-S000000-E002959.0000.V05B.30min.tif
```

Point Clouds

